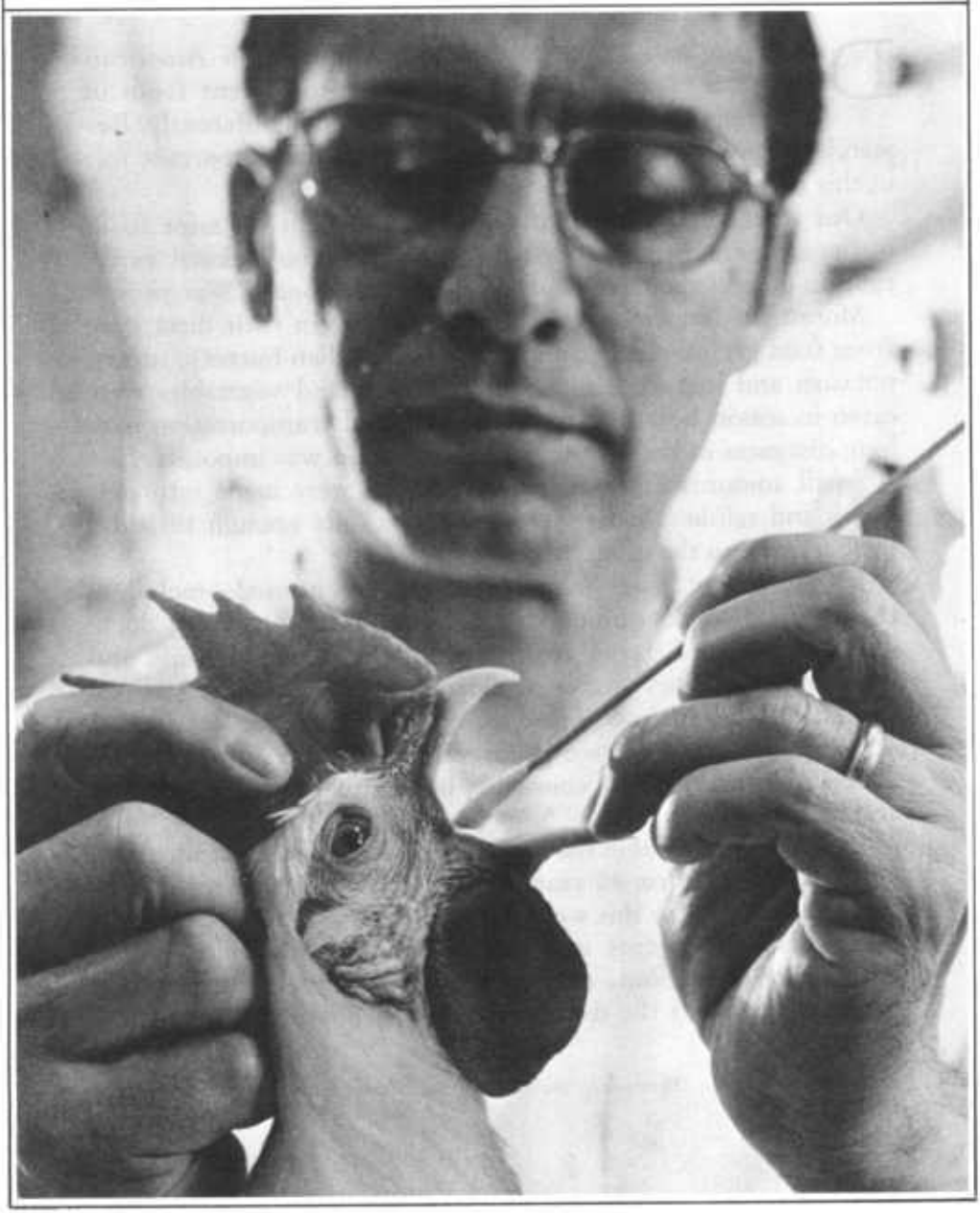
TOWARD A BETTER LIFE



Home Food Preparation Undergoes Big Changes

By Jane M. Porter

During the last 75 years a major revolution in American diets has taken place. We not only eat different foods in different amounts but we prepare our food differently. Research in State Experiment Stations has played an important role in this revolution.

Our forefathers a hundred years ago ate about the same foods in the same seasonal rotations and with the same regional variations in diets as their ancestors of the Revolutionary War period.

More than 80 percent of the food calories in their diets were from food grains, meats, animal fats (other than butter), sugars, potatoes and mature legumes. Fresh fruits and vegetables were eaten in season but they are perishable, and transportation over long distances in the absence of refrigeration was impossible.

Small amounts of fruits and vegetables were made into preserves and relishes. Some were dried, but only enough to add a little variety to the monotonous winter diet.

In the spring wild greens were eagerly hunted—including tender young shoots of dandelion, polk, lamb's-quarters, dock, mustard, pigweed, ferns, Russian thistle, meadow cowslips, and snow thistles. They were considered a "spring-tonic" which would cleanse the blood. These spring greens are excellent sources of vitamins A and C, two essential nutrients that were notably deficient in winter diets consisting largely of cereals, meats, and animal fats.

Significant changes in the kinds of foods in the family diet took place during the first 40 years of the 20th century. Among factors contributing to this were shifts in relative food prices, technological developments in food transportation and processing, nationwide propaganda during World War I for wheatless and meatless days, and the dramatic and well publicized discoveries of vitamins.

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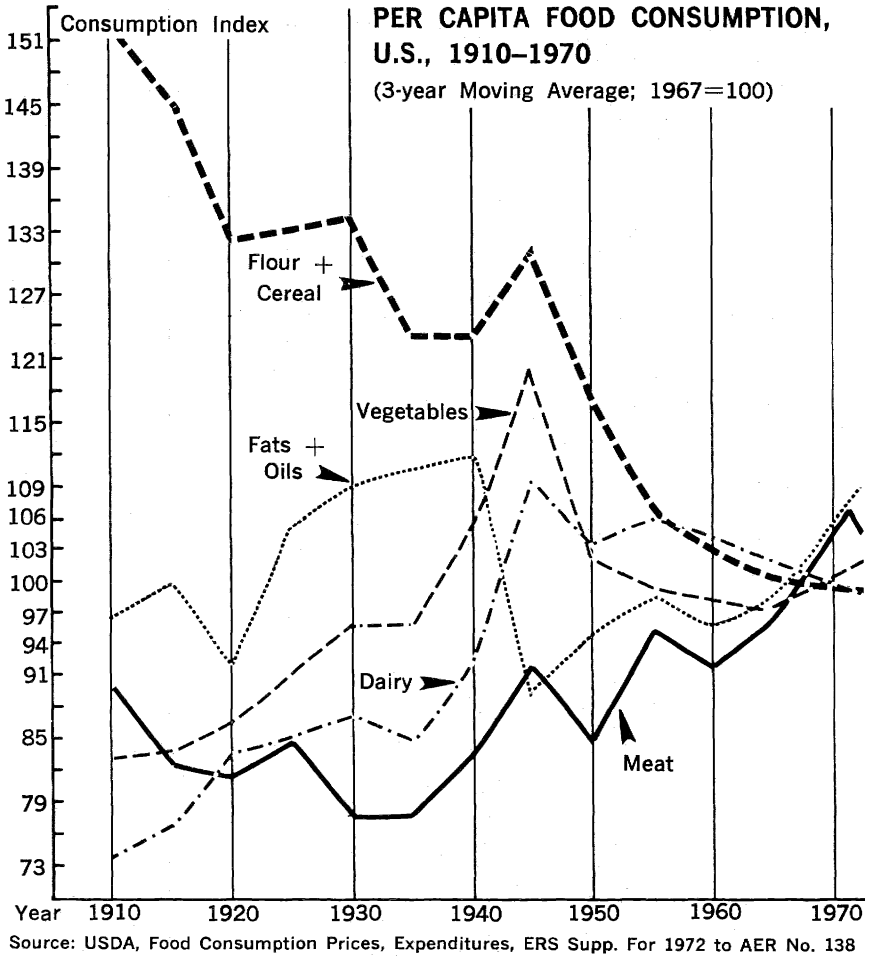
During the depression of the 1930's, many families produced most of their own food.

The State Agricultural Experiment Stations were important contributors to the new technologies and to research on vitamins. Indirectly they had contributed to the changes in the relative prices of foods through research which made dry-land farming and irrigated farming profitable, through improved varieties and means of combating insects and diseases, and through contributions to food technology.

The area in crops expanded relative to the area in pastures and grasslands. At the same time population was increasing rapidly. Food prices increased, particularly during World War I, but increases were larger in meat prices than in other food prices.

Production and consumption of dairy products and eggs was increasing, due to experiment station research in animal breeding, nutrition and disease, and handling and processing of dairy products.

The depression years of the 1930's reinforced the trend in dietary changes. Both rural and urban families faced with loss of cash income tried to meet part of their food needs from home food production. The results of experiment station research on fruits and vegetables, backyard poultry flocks, and rabbits for meat were widely available in popular bulletins, through Extension services, and formed the basis of regular feature articles in newspapers and magazines.



Source: USDA, Food Consumption Prices, Expenditures, ERS Supp. For 1972 to AER No. 138
All Figures Totals Except Dairy Which Excludes Butter

World War II brought rationing of sugar, fats, meats and canned fruits and vegetables, further directing consumption away from these products and towards eggs, milk products, and fresh fruits and vegetables. By this time the term "protective foods" was popularly applied to these latter foods.

Nutritionists had worked out dietary standards for families at various income levels. These were simplified by organization into seven basic food groups which were used in mounting an intensive nutrition education program.

Laboratory scientists had learned to synthesize some vitamins during the 1930's. As a wartime measure, refined cereal grains were enriched with three B vitamins, iron, and calcium. Oleomargarine was fortified with vitamin A, and milk was fortified with vitamin D.

Food rationing during World War II did not restrict total food consumption or decrease the nutritional quality of family diets. In fact, with increased income due to full employment and overtime work, Americans were eating better than they ever had before.

The Problem With Potatoes

Forty years ago the housewife was completely in the dark in purchasing potatoes. Sometimes the potatoes would mash well and turn out white and fluffy. Sometimes they would be heavy and soggy. In boiling, potatoes often developed brown streaks or sloughed off their outer layers. There were no satisfactory chemical or physical standards for judging the cooking quality of potatoes. Neither the variety nor the raw appearance of the potato gave any clue.

Investigators in the State Experiment Stations in Maine, Vermont, New York, Colorado and Montana during the 1930's resolved many of these problems.

It was found that sugar content of the potato was a primary factor governing its cooking quality. Potatoes stored at temperatures near freezing retained a high sugar content. When cooked the sugar tended to caramelize, causing browning and sogginess. Several days storage at room temperature would convert the sugar to starch. The remedy: Don't keep potatoes in the refrigerator for several days before cooking.

Mineral impurities in cooking water were frequent causes of discoloration.

Research discoveries that some vitamins were water soluble, others were fat soluble, and still others easily destroyed by heat led to suspicions that unnecessary nutrient losses were taking place in food after it reached the family's kitchen.

Research on meat cookery began in 1929 at the Missouri Experiment Station. By 1936, six stations—Iowa, Kansas, Minnesota, Missouri, Texas and North Dakota—had organized a committee on meat cookery. Their studies concluded that low temperature roasting of meat resulted in less shrinkage, less loss of nutrients, and improved tenderness.

Meat drippings were found to be high in nutrients and their use in soups, sauces, gravies, and stews was recommended.

Open pan roasting provided the attractive outer browning formerly gained by searing at high temperatures. Use of a meat thermometer was strongly recommended. This resulted in public demand for meat thermometers and open roasting pans.

A quiet revolution in meat cookery took place as the new methods were disseminated through extension agents, stove manufacturers, public utilities, magazines, and cookbooks.

The meat cookery project was soon followed by research on cooking of other foods. This was a landmark in experiment station research because it was organized as a national cooperative project on the conservation of nutritive values of foods. It was first announced in 1941.

Within three years 46 stations in 45 states were cooperating, along with the U. S. Department of Agriculture (USDA) Bureau of Human Nutrition and Home Economics, and the USDA vegetable breeding laboratory at Charleston, S.C. In each State Experiment Station, several departments were cooperating with the home economics department.

Research soon demonstrated that there was a large loss of vitamins in fruits and vegetables between harvesting and consumption. The amount of the loss could be greatly reduced by certain methods of handling and preparation.

Immediate and continued refrigeration from harvesting to cooking reduced losses. Quick cooking in minimum amounts of water helped to conserve vitamins. The cooking water had a high vitamin content and should be eaten with the vegetables or used in soups, sauces or gravies. Today most people cook vegetables in tightly covered saucepans, with only enough water to prevent burning.

A large volume of basic and applied research was carried out under the umbrella of the National Cooperative Project on the Conservation of Nutritive Values in foods. Corn in the form of cornmeal, grits and hominy supply most of the calories of family diets in some parts of the country but processing methods denuded them of much of the vitamins, mineral and protein content of whole grain corn.

Experiment station workers in South Carolina developed a method of incorporating vitamins and minerals in gelatinized ground grits, and reducing this product to particles the size and color of commercial products. These were then mixed with the regular commercial product as carriers of the enrichment.

Nutrition educators tried unsuccessfully to teach people to eat unpolished brown rice because it contained vitamins, minerals and proteins not present in the more highly processed white rice. The discovery that the B vitamins dissolved in the cooking water of vegetables would be gradually reabsorbed into the vegetable

Left, good cooks began to use meat thermometers when research demonstrated that low temperature cooking of meat reduces shrinkage and produces more flavorful roasts. Right, American food variety and abundance at every season is envy of most of world.

tissues afforded basic knowledge for developing processes to conserve the nutrients or enrich white rice. The processes have been adopted commercially, with resultant products marketed as "enriched" rice.

George III and the Tin Can

Preservation of food from one season to the next has always meant the difference between a full stomach and an empty one. The American colonists knew how to preserve food by drying, salting, pickling, fermenting and smoking, skills known since the dawn of recorded history. Then in 1810 two inventions revolutionized food processing: (1) Nicholas Appert in France invented the process of sterilizing foods in airtight containers, and (2) a patent for manufacturing a tin can was granted by George III in England. Ten years later canning plants were operating in the United States.

Appert's method of processing cans or bottles submerged in boiling water was quite satisfactory for fruits and acid vegetables like tomatoes. But there was a high rate of spoilage in corn, green beans, green peas and similar vegetables, meat and fish canned by this method. Invention of the pressure cooker by A. K. Shriver of Baltimore in 1874 enabled canners to process foods at temperatures up to 250° F instead of 212° F, the boiling point of water. It greatly reduced losses due to spoilage and was in general use by canneries within 20 years.

The number of canning establishments increased from less

than 100 in 1870 to 1,800 in 1900. Nevertheless, commercially canned food was expensive, not universally available, and continued to have a bad reputation for spoilage.

In seeking to reduce losses and improve the reputation of their product, some commercial canners consulted the State Experiment Stations in the mid-1890's.

H. L. Russell of the Wisconsin State Experiment Station observed on examining the records of a green pea cannery that most of the spoilage had occurred in batches processed on days when the processing time had been less than normal. He was fortunate in working with a cannery which had kept records. Many did not at that period, and some unscrupulous operators opened and reprocessed spoiled cans.

The problem of the canners was that long processing resulted in a product which was not very attractive or appetizing, so they tried to minimize processing time. Russell was able to reduce spoilage from 5.0 percent to 0.05 percent by increasing pressure from 10 to 15 pounds and increasing processing time from 26 to 28 minutes.

Concurrent work by the New York State station at Geneva produced similar results, and USDA's Office of Experiment Stations disseminated the new knowledge to the general public in Farmers' Bulletin 73 of 1898.

This information was helpful to the canning industry, but was of no value to the homemaker. She had no pressure cooker and had probably never heard of such a thing. She made preserves and pickles and canned a few peaches, cherries and tomatoes, but did not attempt to can lima beans, string beans, corn, peas, or asparagus.

The homemaker used whatever jars, bottles and stoneware were available and could be sealed by corks or paraffin or a combination of the two. She used the open-kettle method because paraffin would not remain in place during a boiling water bath process.

More affluent homemakers canned in Mason jars, invented in 1858. These were sealed by a rubber gasket and a screw top or by a spring clamp and glass lid with a rubber gasket. However, all glass was still hand blown and relatively expensive.

Mechanization of glass blowing in 1903 made possible the mass production of glass food containers, greatly reducing the cost of Mason jars. Home canning of non-acid vegetables using the Appert method soon became widespread.

Meanwhile, chemists and bacteriologists in the State Experi-

ment Stations and elsewhere were learning more about yeasts, molds and bacteria. It was found that most of these in the growth stage were readily destroyed at 212° F, but that in the dormant stage (spores) they were much more resistant to heat.

In 1906 an innovative researcher at the Oregon State Experiment Station applied this knowledge and devised a system for intermittent processing. With this system, processing at lower temperatures would kill the active organisms and an interval would allow the activation of spores, which would then be killed by a second processing period. A third period was added on a third day to ensure a complete kill.

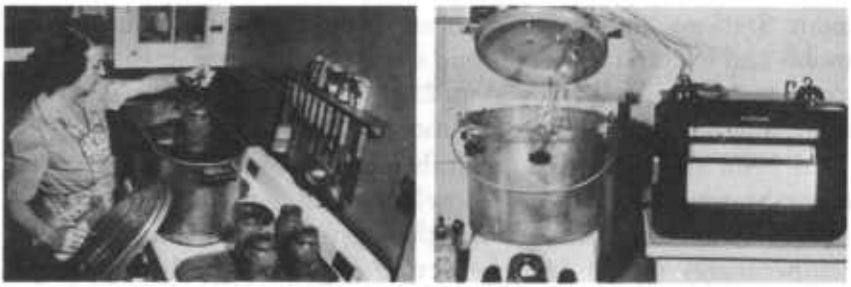
The advantage of this process was that it prevented overcooking, preserving the product's texture and appearance. This method, together with the single stage water-bath process, was the standard one recommended by Federal and State extension services through World War I. However, by 1917 a small portable pressure cooker-canner of riveted steel or aluminum was on the market and this was recommended for meat and fish.

The water-bath processing methods were so effective in eliminating spoilage that people became less cautious in using canned goods. However, there was one bacteria, *Clostridium botulinum,* widely distributed in soils and harmless in the presence of oxygen, which, if it developed in the absence of air, produced a deadly toxin. If it was the only surviving bacteria in otherwise sterile canned goods there were no warning signs of spoilage. It was very resistant to heat, surviving several minutes at even 240° F.

During the period from 1916 to 1924, numerous cases of botulism poisoning occurred in the United States and Europe. This triggered extensive research on the problem by public health services and public and private experiment stations on both sides of the Atlantic.

Although there were no formally organized regional, national or international projects on botulism, researchers from California to Scotland and Germany were working on various aspects of the subject. Channels of communication through professional societies and government agencies such as USDA's Office of Experiment Stations were functioning so effectively that researchers were quickly informed of new knowledge. Within a few years following the isolation of *Clostridium botulinum,* researchers in State Agricultural Experiment Stations from Massachusetts to California had found its spores in samples of their soils.

When USDA research workers devised a technology for re-



Right, thermocouples inside canning jars are checked to insure cooking temperature high enough so botulism bacilli are destroyed. This also determines necessary processing time for home canning of various types of food. Left, canning tomatoes in improvised boiling water bath. Photos were taken in 1940's.

cording the temperatures inside cans during processing, research workers in State Experiment Stations quickly applied it to processing in glass jars.

USDA began recommending pressure processing for non-acid or low-acid vegetables to homemakers in the early 1920's. However, water-bath processes continued to be widely used until after World War II. Thousands of housewives had successfully canned by this method all of their lives.

The botulin toxin occurred infrequently, under conditions where it went undetected until the food was eaten and caused illness and death. Cases went unrecognized or unreported so that the public was not especially alarmed. Still, many homemakers routinely boiled all canned vegetables before serving. Perhaps the people who continued to can during the inter-war years were thoroughly experienced and attentive to sanitation in the preparation and canning of vegetables.

These circumstances changed abruptly during World War II. Thousands of women who had never canned began to can foods from "Victory Gardens" or from the market place to supplement their quota of rationed canned goods. Few owned or had access to canning pressure cookers.

Many agencies, public and private, were giving out conflicting canning instructions. Although all State colleges recommended the pressure cooker as the first choice method for canning non-acid or low-acid vegetables, some still approved other methods. The cases of botulism poisoning that occurred during World War II were all traced to home canned food.

In 1943 USDA issued a warning against tasting food before boiling if it was non-acid and had been canned without a pres-

Right, not all pots that cook with pressure are suited for canning foods. Two pots in rear may be used for canning because they have gages that control pressure accurately. Pressure saucepan in foreground with 15-pound pressure control is designed for quick cooking and should not be used to can. Left, Louisiana nutritionist watches young homemaker demonstrate using a pressure canner to preserve green beans.

sure cooker, or canned in one which had not been tested for accuracy of pressure. A study of pressure gages by the Nebraska State Experiment Station in 1938 had revealed that only 36 percent of the canners tested had gages accurate with ± 0.5 pound.

Concurrently, intensive research was undertaken by the Massachusetts State Experiment Station to determine exact processing times necessary for all types of foods in various sizes of glass containers, types of closures, and sizes and types of pressure canners. A little later USDA began research in this field.

By 1948, new procedures and timetables had been developed using all the testing devices previously employed in developing procedures for commercial canning. The more precise procedures made it possible to reduce processing time. The result was that the appearance, taste and nutritive values of home-canned foods were improved.

Boil 20 Minutes and Live

However, home-canning is a precise science and variations from recommended procedures, which might occur where in-

experienced canners begin to preserve the produce of home gardens, could result in a new outbreak of botulism poisoning from home-canned food. The recent experiences of some commercial canners, who adopted new technological developments without making adequate laboratory checks, should be a warning to everyone. The rule is, if in doubt boil 20 minutes before tasting.

State extension services have bulletins on home canning which are available through county agent offices or directly through the Extension Service of the State's Land Grant College.

State Experiment Stations have been responsible for much of the research upon which the commercial frozen food industry is based. To the extent that new information was applicable to home freezing of fruits, vegetables and meats, it has been adapted and disseminated.

The Washington State station began a study in 1936 to determine the adaptability of different varieties of vegetables to preservation by freezing. Frozen food locker plants were becoming common in rural areas, and by 1940 a number of stations were publishing bulletins on the preparation and packaging of foods for frozen storage. At the same time the experiment stations began pointing out the need for satisfactory home storage for both home processed and commercial frozen foods.

Refrigerators with across-the-top freezer compartments were on the market before World War II stopped the production of durable consumer goods. When production was resumed, virtually all makes featured this improvement.

Although Americans enjoy the greatest abundance and most variety in foods of any people in recorded history, significant numbers of us still do not have diets which meet the National Research Council's "Recommended Dietary Allowances" for nutrients.

Some of us suffer from hidden hunger. We do not eat enough foods containing vitamins A, C, some B vitamins, calcium and iron. Good sources of these nutrients are green leafy vegetables, dark yellow vegetables, citrus, tomatoes, whole grain cereals, milk products, eggs, meats and legumes.

Our diets tend to be too high in fats and sugars. Such diets can be contributing factors to obesity, heart and circulatory diseases, and diabetes.

Numerous bulletins on food and nutrition, food preparation and storage, and family food budgeting are available from county home demonstration agents, State Experiment Stations, and USDA. Most are free for the asking.